Reg. No. :

Question Paper Code: R3D01

B.E./B.Tech. DEGREE EXAMINATION, NOV 2025

Third Semester

Computer Science and Business Systems

R21UCB301–FORMAL LANGUAGE AND AUTOMATA THEORY

(Regulations R2021)

Duration: Three hours   Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 2 = 20 Marks)

1. Construct NFA to accept all strings contains {a,b} which starting with "abb".   CO1- U

2. Construct a DFA that recognize the strings of {0,1} that do not contain the   CO6- App
    substring 101.

3. Convert the following Finite Automata to Regular Grammar   CO2- App
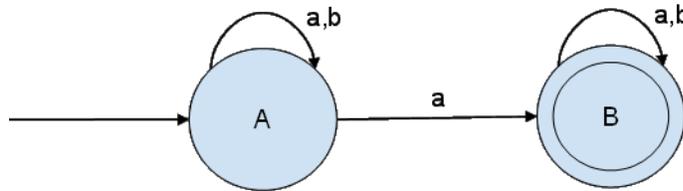
4. List out the closure properties of Regular Language.   CO2- Ana

5. List out the applications of Context Free Grammar.   CO6- Ana

6. Remove ε production from the given context free grammar   CO6- U

    S->XYX, X->0X|ε, y->1Y|ε

7. Define the formal definition of Linear Bounded automata.   CO6- U

8. Construct a PDA equivalent to CFG   CO6- U

    S->0BB,B->0S|1S|0

9. What do you mean by Universal Turing Machine?   CO2- U

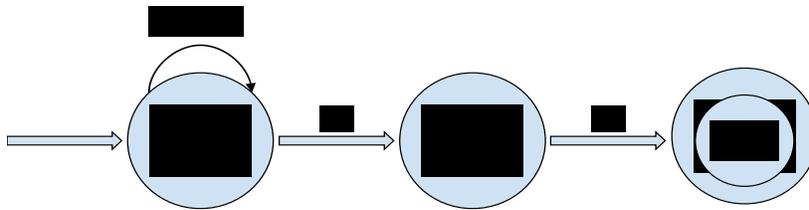10. Define Diagonalization language (L_d).   CO2- U

11. (a) Construction of NFA to DFA using Subset construction methods.   CO1-App   (16)
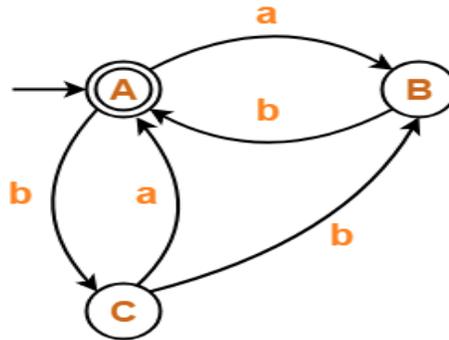
	a	b
P	{p,q}	{p}
Q	{r}	{r}
R	{s}	-
*s	{s}	{s}

Or

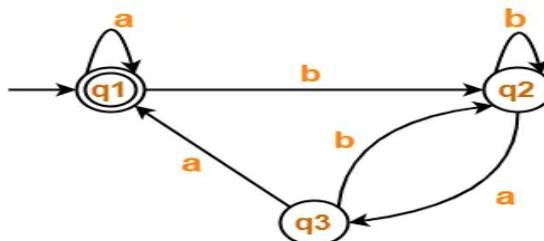(b) Construction of NFA to DFA using subset Construction methods   CO1-App   (16)

12. (a) Find regular expression for the following DFA using State CO2- App   (16)
Elimination method.

Or

(b) Find regular expression for the following DFA using Arden's CO2- App   (16)
Theorem

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13. (a) (i) Simplify the following grammar and find its equivalent in CNF.   CO2-App   (16)
       S->bA | aB ,
       A->bAA | aS | a,
       B->aBB | bS | b (12)
       (ii) Show that the grammar S->SbS|a is ambiguous or not for the
       string W=ababa(4)

                                          Or

    (b) (i) Convert the following CFG to GNF   CO2-App   (16)
       S→a|aA|B
       A→aBB| ε
       B→Aa|b

14. (a) Convert the PDA M=({q0,q1},{0,1},{X,Z0},δ, q0,Z0,Φ) into   CO1-App   (16)
       Grammar. Where δ is defined as
       a. $\delta(q0,0,Z0) = (q1,XZ0)$
       b. $\delta(q0,0,X)=(q1,XX)$
       c. $\delta(q0,1,X) = (q1, \varepsilon)$
       d. $\delta(q1,1,X) = (q1, \varepsilon)$
       e. $\delta(q1, \varepsilon, X) = (q1, \varepsilon)$
       f. $\delta(q1, \varepsilon, Z0) = (q1, \varepsilon)$

                                          Or

    (b) (i) Construct PDA for the Language L=$\{0^m 1^m | m >= 1\}$ (8)   CO1-App   (16)
       (ii) Convert the following CFG to Push Down Automata.   (8)
           S->aDB
           A->aD
           B->b
           D->a
           C>a

15. (a) Construct Turing Machine for the Language L=$\{a^n b^n\}$ where n>=1.   CO2-App   (16)
                                          Or
    (b) Construct the TM to validate L=$\{a^m b^m c^m | m >= 1\}$ CO2- App   (16)